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BULLETIN  
OF THE  
TORREY BOTANICAL CLUB

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MAY 1898

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A Revision of the North American *Eurhynchia*.

By A. J. GROUT.

A careful study of the North American species ordinarily referred to the genus *Eurhynchium*, so far as represented in the herbaria of Columbia University, the University of Wisconsin, the National Museum, the collections of Prof. John Macoun, and some private herbaria, together with selected specimens from the herbarium of Harvard University, have convinced me that the relationship of these species will be better represented by referring them to more than one genus.

I take pleasure in acknowledging my obligations to Prof. L. M. Underwood, Mr. F. V. Coville, Prof. C. R. Barnes, Prof. John Macoun, and Dr. B. L. Robinson for specimens loaned. I am also greatly indebted to Mr. H. N. Dixon for valuable notes on *E. praelongum*, *E. lians*, and *E. Stokesii*, and for a large number of English specimens of the same; also to Dr. G. N. Best and M. Jules Cardot for various notes and specimens. Mrs. E. G. Britton and Mr. M. A. Howe have frequently assisted me by valuable suggestions, and by looking up references and revising manuscript.

Leaves papillose by the thickened angles of the cell walls; leaf cells 8-15 : 1.

*Brylmia*.

Leaves very slightly or not at all papillose; leaf cells 4-6 : 1.

Leaves very concave, cochleariform, abruptly long filiform-acuminate.

*Cirriphyllum*.

Leaves plane or slightly concave, not cochleariform; branch leaves acute to acuminate.

*Eurhynchium*.

[Issued 12 May.]

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## CIRRIPHYLLUM gen. nov.

*Gametophyte* very robust, glossy, growing on earth and rocks, occasionally on roots of trees; stems possessing a well differentiated central strand, prostrate or creeping, irregularly or subpinnately branching, branches julaceous, terete-foliate. Leaves imbricate, *very concave, spoon-shaped, rounded and often cucullate at apex, abruptly drawn out into a long filiform acumination*, costate to the middle or beyond; median leaf-cells linear, 10-15 : 1; basal broader and shorter; alar often quadrate. *Sporophyte* as in *Brachythecium* except that the operculum is usually long-rostrate.

The plants referred to this genus certainly have no closer genetic relationship with those retained to represent *Eurhynchium* than with several other genera. The rostrate operculum is the only character which would link the two in one genus. Lindberg transferred the European representatives of this genus to the division *Rhynchostegium* of the genus *Hypnum*, while Kindberg places them all in *Brachythecium*. The gametophyte characters of several species are certainly more like *Brachythecium* than *Eurhynchium*. The resemblance between *C. Tommasinii* and *Brachythecium albicans* is certainly very striking, and robust forms of the latter have been taken for the former. Consequently it seems far more satisfactory to constitute the following species a separate genus, far better characterized than many of the allied genera, also more distinct and more homogeneous. Some of the species here referred to *Cirriphyllum* have been referred to *Myurium*, but the fact that the leaves of the species upon which the genus was founded, *M. hebridarium* Schimp, are ecostate seems to be sufficient proof that it is not congeneric with any of the following species.

Leaves with a very long filiform acumination.

Apex of branch leaves strongly cucullate at base of the acumination.

High alpine mosses growing on stones; costa of stem leaves very short.

1. *C. cirrosum*.

Lowland mosses growing on the ground and roots of trees; costa of stem leaves extending  $\frac{2}{3}$  their length.

3. *C. piliferum*.

Apex of branch leaves not cucullate at base of acumination.

Acumination 0.3-0.4 mm. long; median leaf-cells 3-4 : 1.

2. *C. Brandegei*.

Acumination 0.5-0.8 mm. long; median leaf-cells 8-12 : 1.

1a. *C. cirrosum Coloradense*.

Leaves shorter acuminate, apex twisted.

4. *C. Boscii*.

## 1. CIRRIPHYLLUM CIRROSUM (Schwaegr).

*Hypnum cirrosus* Schwaegr. Schulte's Reise auf d. Glockner, 365. 1804.

*Brachythecium cirrosus* Schimp. Syn. Ed. 1: 696. 1860.

*Eurhynchium Vaucheri* var. *julaceum* Br. & Sch. Bryol. Eur. fasc. 57-67, pl. 530. 1854.

*Myurium* (?) *Herjedalicum* Schimp. Syn. Musc. 696. 1860 (*fide Juratzka*).

*Eurhynchium cirrosus* Husnot, Musc. Gall. 338. 1893.

*Gametophyte* in bright glossy yellow-green mats; primary stems creeping, irregularly branching; branches 5-10 mm. long, julaceous; branch leaves appressed-imbricate, decurrent, oblong-ovate, not including acumination  $1.3 \times 0.65$  mm., entire or serrulate above, abruptly narrowed to a filiform acumination which is serrulate to nearly entire, 0.5 mm. long, concave and spoon-shaped, cucullate at base of acumination; margins somewhat reflexed below; costa short, extending from  $\frac{1}{3}$ - $\frac{1}{2}$  length of leaf, sometimes divided or branching; median cells 10-12:1; alar quadrate to hexagonal, indistinct; stem leaves ovate, body of leaf 1.8-2.4 mm., acumination 0.6-1 mm. long, area of quadrate-hexagonal alar cells much larger; costa very short, median leaf-cells somewhat shorter: dioicous; perichaetial leaves ecostate, serrate at apex, abruptly narrowed into a long filiform squarrose serrate acumination. *Sporophyte* 15 mm. high; seta twisted to the right, rough with blunt papillae; capsule ovoid, unsymmetric, horizontal, with operculum 2 mm. long, 2-1, chestnut-brown, not contracted under the mouth when dry; operculum sharply conical, not rostrate; annulus\* not highly differentiated, segments split between the articulations; cilia 2, strongly nodose; spores 18-20  $\mu$ , finely roughened.

Sporophyte not yet reported from America. Description of sporophyte adapted from Limpricht, Rab. Krypt. Fl. 4<sup>3</sup>: 183. 1897.

Growing on rocks in mountains. Colorado, Brandege, Wolf & Rothrock; Pike's Peak, Mrs. S. B. Clark, J. M. Holzinger.

Type locality, European.

ILLUSTRATIONS. Br. & Sch. l. c; Husnot, Musc. Gall. pl. 97; Limpricht, Rab. Krypt. Fl. 4<sup>3</sup> f. 386; Dixon & Jameson Handb. Brit. Mosses, pl. 53, f. G.

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\* Mrs. Britton, March, 1897, in specimens collected in Algau by Molendo (Herb. Jaeger), found the annulus to consist of 3 rows of very irregular and persistent cells.

Our American specimens are less robust and shorter stemmed than most of the European material at hand and the stems are not stoloniferous or the branches flagelliform as is usually the case with European specimens, yet some European plants agree almost exactly with the American plant and the two are almost certainly the same species. *C. cirrosum* is a very variable and poorly understood plant even in Europe.

1a. CIRRIPHYLLUM CIRROSUM COLORADENSE (Aust.).

*Hypnum Coloradense* Aust. Bot. Gaz. 2: 111. 1877.

*Gametophyte* robust; stems 3–5 cm. long, erect or at length prostrate, sparingly branched; leaves loosely imbricate, oblong-ovate, 2–2.2 × 0.9 mm. without the acumination, which is 0.5–0.8 mm. long, nearly entire, abruptly long filiform acuminate but not at all cucullate, much less concave than in the typical form, somewhat plicate.

Type locality, Alma, Park Co., Colorado, Miss H. J. Biddlecome. Type in the herbarium of Columbia University.

Distinguished by the stout, sparingly branched stems and loosely imbricate leaves which are not cucullate at apex. It does not correspond with any of the European varieties mentioned by Limpricht so far as can be determined from the material at hand. It is clear that Austin did not know the true *cirrosum* for there is a specimen of it from Colorado labelled in Austin's handwriting, "*Hypnum Coloradense* var. *dimidio minus*, *sericeo-aureo viride*, *caule subjulaceo tereti*."

2. CIRRIPHYLLUM BRANDEGEI (Aust.).

*Hypnum Brandegei* Aust. Bot. Gaz. 3: 31. 1878.

*Gametophyte* densely caespitose, yellow-green; stems erect, 3–4 cm. high, nearly simple, terete-foliate, obtuse; leaves loosely appressed-imbricate, not decurrent, ovate, abruptly subulate-acuminate to filiform-acuminate, 2 × 0.9 mm., acumination 0.3–0.4 mm. long, entire, concave, plicate; margins plane; costa reaching the middle of leaf, sometimes forking; median cells oblong-linear, 25–30 × 9  $\mu$ ; basal cells shorter and broader, alar enlarged-quadrate. *Sporophyte* unknown.

Type locality, Colorado, Brandegee. Type in the Columbia University Herbarium.

Easily distinguished from *C. cirrosum* by its caespitose habit, short entire acumen and much looser areolation.

## 3. CIRRIPHYLLUM PILIFERUM (Schreb.).

*Hypnum piliferum* Schreb, Spicil. Flor. Lips. 91. 1771.

*Eurhynchium piliferum* Br. & Sch. Bryol. Eur. fasc. 57-61, pl. 531. 1854.

*Rhynchostegium piliferum* De Not. Cronaca, 2: 11. 1867.

*Brachythecium piliferum* Kindb. Can. Rec. Sci. 1894: 73. 1894.

*Gametophyte* in wide loose mats, glossy, bright yellowish-green; stems long, sometimes reaching 20 cm., creeping, irregularly divided, pinnately branching, sparingly radiculose; branches rather distant, 10-15 mm. long, terete-foliate; branch leaves loosely erect, imbricate, decurrent, ovate, very concave and spoon-shaped, the rounded apex abruptly narrowed into a long, filiform acumination;  $1.2 \times 0.8$  mm., smaller near ends of branches; acumination one-half length of the body of leaf, apex cucullate, margins strongly serrate, more nearly or quite entire at base, costa fully two-thirds length of body of leaf; median leaf-cells linear,  $10-15 \times 1$ ; alar cells abruptly enlarged and inflated; stem leaves larger and more broadly ovate,  $1.5-2 \times 1$  mm. ( $2-2.5 \times 1-1.2$  mm. according to Limpricht), enlarged and inflated alar cells more numerous: dioicous; male plants somewhat smaller; perigonial leaves ovate, long-acuminate, ecostate; perichaetium sheathing, the leaves ovate, somewhat abruptly narrowed to a very long slender erect-spreading acumination, somewhat serrulate, ecostate or some of the inner slightly costate. *Sporophyte* 2-3 cm. high; seta dark red-brown, twisted to the right, very rough with low blunt papillae; capsule red-brown, inclined to horizontal, oblong-ovoid, arcuate; urn 2.5 mm. long, 2-3:1; operculum nearly as long as the urn, long rostrate from a conic base; annulus of at least two rows of cells, detachable; teeth of peristome very slender pointed, very strongly papillose-roughened above; segments nearly or quite as long as the teeth, slender, split between the articulations; cilia 2 or 3, long and very slender, nodose to subappendiculate; spores smooth,  $12-16 \mu$ , maturing in winter or early spring; sporophyte rare.

Type locality, European.

On the ground and base of trees in woods and shady meadows, most frequently on steep springy shaded banks of rivulets, often closely interwoven with other mosses; New Brunswick, J. Moser; New Hampshire, James; Vermont, Frost, Carey; New York, E. C. Howe, Peck; New Jersey, Austin; Pennsylvania, James, D. A. Burnett; Ohio, Sullivant; Washington, D. C., Oldberg.

ILLUSTRATIONS. Br. & Sch. l. c.; Hedw. Musc. Frond. 4: 35, *pl.* 14, 1794: Husnot, Musc. Gall. *pl.* 97; Dixon & Jam. Handb. Brit. Mosses, *pl.* 53, *f.* K.

EXSICCATI. Sulliv. & Lesq. Musc. Bor. Am. (Ed. 1) 290<sup>b</sup>, (Ed. 2) 492. Austin, Musc. Appal. 336.

Infrequent or else overlooked because of its sterility.

Our American plant is much less robust than the European.

*Cirriphyllum Tommasinii* (Sendt.) (*Hypnum Vaucheri* Schimp. not Lesq.), has been several times reported from America but I have been unable to find any American specimens of this species in any of the herbaria enumerated above. *Brachythecium albicans* has been reported as this species and very likely forms of *C. cirrosus* may have been referred here.

#### 4. CIRRIPHYLLUM BOSCHII (Schwaegr).

*Hypnum Boschii* Schwaegr. Suppl. 1: 223. 1816.

*Hypnum illecebrum* Hedw. Spec. Musc. 252. *pl.* 66 (excl. varieties). 1806.

*Eurhynchium Boschii* Jaegr. & Sauerb. St. Gall. Nat. Gesell. 1876-77: 361. 1878.

*Myurium Boschii* Kindb. Can. Rec. Sci. 1894: 73. 1894.

*Gametophyte* in thick soft loosely intricate cushions, or in loose thin mats, on the ground among the grass, glossy, golden-yellow to brownish-yellow; stems creeping or ascending, irregularly divided and branching; branches and shorter stems suberect, turgid, terete-foliate; stems often stoloniferous and subpinnately branching, sparingly radiculose, 5-15 cm. long; branches 1-3 cm. long, the longer more or less subdivided; branch leaves erect-open when moist, loosely imbricate when dry, decurrent, scarious, broadly ovate, very concave, spoon-shaped, 2-2.5 × 1.4 mm., serrate to the middle, apex rounded and abruptly acuminate, acumination twisted one-half turn to the right; basal angles rounded, subauriculate; costa extending three-fourths length of leaf; leaf-cells thick-walled, the median linear, 6-10:1, basal and apical shorter and broader, the alar not differentiated; leaves of the stoloniferous stems much smaller, less abruptly narrowed to the longer acumination, costa shorter: stem leaves less concave, less abruptly acuminate, acumination longer, less frequently twisted: apparently dioicous, male branches not seen; perichaetial leaves with oblong-ovate sheathing bases, abruptly narrowed to a filiform spreading acumination, ecostate and entire or toothed below base of acumination. *Sporo-*

*phlyte* 1.5–3 mm. high ; seta red to red-brown, smooth, slightly twisted to the right ; capsule brown, inclined, unsymmetric to arcuate, gradually narrowed into the seta, oblong, strongly arcuate and contracted under the mouth when dry, with operculum  $3-4 \times 1$  mm. ; annulus of at least two rows of cells ; operculum conic, long rostrate, about one-half the length of urn ; segments as long as the teeth, split between the articulations ; cilia 2 or 3, well developed, nodose ; spores nearly smooth,  $16 \mu$  ; maturing in autumn.

Type locality, North America ; collected by Bosc, probably in South Carolina. Type in the Boissier Herbarium at Geneva.

On the ground and rocks in shady places and open fields. Vermont to Florida and Louisiana, west to Missouri and Illinois ; more abundant southward. The only specimen I have seen from Canada was of Drummond's collection and was in Prof. Macoun's collection as from "Upper Canada." Prof. Macoun suggests that it may have been from Niagara Falls.

ILLUSTRATIONS. Sulliv. Icon. Musc. *pl.* 106.

EXSICCATI. Drum. Musc. Am. (S. States), 132 ; Sulliv. Musc. Allegh. 42 ; Sulliv. & Lesq. Musc., Bor. Am. (Ed. 2) 435, (Ed. 1) 294 ; Austin Musc. Appal. 331 ; Ren. & Card. Musc. Am. Sept. Exsic. 117.

A very striking and easily identified moss, but one which is unique in many respects and whose relationships are obscure.

Specimens of *Myuroclada concinna* (Wils.) Besch. communicated to Mrs. Britton by Bescherelle have been carefully compared with *Hypnum Boscii*, Swaegr. Bescherelle, Ann. des Sci. Nat. VII. 17 : 380, 1893, intimates that the latter species belongs to his new genus *Myuroclada*, founded upon the former. The two species resemble each other superficially to a striking degree. The glossy golden yellow turgid branches, rostrate operculum, smooth seta, and very concave cochleariform leaves are marked characteristics of both, but under the microscope such important differences appear that I am not able to consider them congeneric. *M. concinna* has the segments of the inner peristome slender with cilia very rudimentary or none ; annulus lacking ; leaves obtuse : *leaf-cells thick-walled, broadly oblong, to oblong rhomboid, 1-2 : 1*. *Hypnum Boscii* has the segments broader : cilia 2 or 3, well developed ; leaves more or less long-acuminate, *leaf-cells linear, 8 : 10 : 1*.



The relationship of *Hypnum Boscii* to the other species referred to *Cirriphyllum* is somewhat less marked than the relationship between the other species of that genus, but it is closer than the relationship between *H. Boscii* and any other genus known to the author.

BRYHNIA Kaurin Bot. Not. 1892: 60. 1892:

(Named for the discoverer of the European representative of the genus, Dr. Nils Bryhn.)

*Gametophyte* medium sized, in intricate mats or cushions, bright yellowish green on the surface, dirty brownish green below. Stems creeping, irregularly divided and branching; central strand present. Leaves concave, serrate, decurrent, conspicuously papillose on the lower surface by the greatly thickened angles of the cell walls; median leaf-cells short, 4-6:1, rather thick-walled; basal and alar cells a little larger and more nearly rectangular. *Sporophyte* much as in *Brachythecium*. Seta rough, twisted to the right; capsule short-oblong, somewhat arcuate; operculum long-conic to sub-rostellate; annulus present, well developed; cilia one or two, well developed, nodose.

The two species which we have referred to this genus (previously known as *Eurhynchium Sullivantii* and *Brachythecium Novae-Angliae*) are undoubtedly very closely related and congeneric but the question of their further relationship is more difficult. They are seemingly intermediate between *Brachythecium* and *Eurhynchium* and were so regarded by the author of this genus. Limpricht admits the genus under protest and says that in his opinion the European representative belongs to *Brachythecium*. On the other hand, there has been an increasing tendency to refer the American representatives to *Eurhynchium*. The shortness of the leaf-cells is a character that does not pertain to *Brachythecium* (except in the anomalous *B. reflexum* and *B. cyrtophyllum*). The thickening of the angles of the cell walls to form papillae occurs in no species of *Brachythecium* and is much more strongly marked than in any other species referred to *Eurhynchium*. The sporophyte does not differ from that of *Brachythecium* except, perhaps, by the longer pointed operculum, but the operculum is far shorter than in *Eurhynchium*. On the whole, therefore, it seems more satisfactory to constitute a separate genus of these species.

M. Bescherelle (Ann. des. Sci. Nat. VII. 17: 378. 1893) refers *B. Novae-Angliae* to *Scleropodium*, a disposition with which I cannot agree as the papillose leaves and the short leaf-cells are not characters of the genus as originally defined.

Branch leaves acute to short-acuminate, apex twisted.

1. *B. Novae-Angliae*.

Branch leaves longer acuminate, apex not twisted.

2. *B. graminicolor*.

#### I. BRYHNIA NOVAE-ANGLIAE (Sulliv. & Lesq.)

*Hypnum Novae-Angliae* Sulliv. & Lesq. Musc. Bor. Am. (Ed. 1) 338. 1856. Sulliv. Mosses of the U. S. 76. 1856.

*Brachythecium Novae-Angliae* Jaeger & Sauerb. St. Gall. Nat. Gesell. 1876-77: 338. 1878.

*Hypnum scabridum* Lindb. Bot. Not. 1887: 41. 1887.

*Bryhnia scabrida* Kaurin Bot. Not. 1892: 60. 1892.

*Eurhynchium Novae-Angliae* Kindb. Can. Rec. Sci. 1894: 23. 1894.

*Hypnum (Cratoneuron) chloropterum* C. Muell. & Kindb. Macoun, Cat. Can. Pl. 6: 231. 1892.

*Eurhynchium chloropterum* C. Muell. & Kindb. Can. Rec. Sci. 1894: 23. 1894.

*Gametophyte* in wide loosely intricate mats, bright green on the outside, dirty brownish green below, stems decumbent; secondary stems sub-erect, about 5 cm. long, subpinnately branching; branches erect-ascending, terete-foliate, often subjulaceous, 5-10 mm. long; branch leaves erect-open, loosely appressed-imbricate when dry, ovate to ovate-lanceolate, decurrent,  $0.8-1.2 \times 0.4-0.6$  mm., serrulate, very concave, not plicate, papillose on the under side by the thickened angles of the cell walls, long-acute to short-acuminate; apex twisted one-half turn to the right; costa thick, extending beyond the middle of the leaf; median leaf-cells oblong-hexagonal, 5:1; alar and basal cells little differentiated, somewhat enlarged; stem leaves broadly ovate to triangular-ovate,  $1-1.4 \times 0.8-1.2$  mm., nearly smooth, longer acuminate; leaf-cells shorter, areolation of decurrent angles somewhat more loose and more nearly rectangular: dioicous; male branches gemmiform; antheridia oblong; perigonal leaves oblong-ovate, gradually long-acuminate; perichaetium about 2 mm. long; the leaves with sheathing bases and squarrose points; inner leaves oblong, long filiform-acuminate, somewhat serrulate above, costate. *Sporophyte* 1-2 cm. high; seta dark red-brown, very rough with broad low papillae; capsule dark red-brown, almost black when old, oblong

cylindric, 3-3.5 mm. long, 4-5 : 1, somewhat arcuate, horizontal to suberect; operculum long-conic, subrostellate; annulus large; segments nearly as long as the teeth; cilia one or two, nearly as long as the segments, strongly nodose; spores minutely roughened, 17-19  $\mu$ , maturing in autumn or winter.

Type locality, mountains of New England.

On earth and stones in wet shady places, especially in mountain regions. Northeastern United States and eastern Canada; south to Maryland; west to Pennsylvania.

ILLUSTRATIONS. Sull. Icon. Musc. *pl.* 118. Limpr. Rab. Krypt. Pl. 4<sup>3</sup>: 139, *f.* 377 (*Bryhnia scabrida*).

EXSICCATI. Sull. & Lesq. Musc. Bor.-Am. (Ed. 1) 338, (Ed. 2) 507; Aust. Musc. Appal. 329; Macoun, Can. Musc. 440; Ren. & Card. Musc. Am. Sept. Exsic. 109.

Easily distinguished by its rostellate capsule, short papillose leaf-cells and twisted leaf apices. The species varies considerably in length of the acumination of leaves so that var. *Delamarei* Ren. & Card. Fl. Miq. 50, does not seem worthy of special mention, although I have not seen specimens of that form.

Limpricht's description (*l. c.*) and several specimens of *Bryhnia scabrida* (Lindb.) Kaurin from Norway have been carefully compared with *B. Novae-Angliae* and the two are not to be distinguished. The measurements of the leaves given by Limpricht for *B. scabrida* are larger than those given for *B. Novae-Angliae* in my Rev. N. Am. Isotheciaceae and Brachythecia, but a further investigation has shown that the maximum measurements there given were too small. There is no difficulty in finding American plants with as large leaves as the European. Specimens of *B. Novae-Angliae* have been sent to Prof. Kaurin and were examined by him and submitted to his friend, E. Ryan. Both agree with me that the American and the European plant are the same. The Newfoundland plant referred by Kindberg to *B. scabrida* is certainly *B. Novae-Angliae*.

Mrs. Britton in 1889 first noted the great resemblance between *B. scabrida* and *B. Novae-Angliae* and sent specimens to Prof. Kaurin for comparison, but this was entirely overlooked in my revision of *Brachythecium*. In 1897 Dr. Best's attention was called to the matter by the Newfoundland plant named *B. scabrida* by

Kindberg, and Dr. Best very kindly called my attention to the great resemblance between the two plants.

*Eurhynchium chloropterum* seems to be nothing more than a slender lighter green form of *B. Novae-Angliae*, having the branch leaves more narrowly acuminate, more closely appressed and more contorted in drying. The areolation is not wider, and a specimen of Canadian Musci, no. 440 (on which the species appears to be founded), is most certainly dioicous. The perichaetial leaves are also faintly costate, as in the ordinary *B. Novae-Angliae*. It is found along the northeast coast of North America. Possibly it should be considered a variety. From my studies in this group I am led to believe that it is not a rare occurrence for male and female branches to occur on the same plant in a species that is ordinarily dioicous. *Vide* note on *Brachythecium Villardi*, Mem. Torr. Bot. Club, 6: 180.

Mr. D. A. Burnett has communicated a peculiar form of this species from Bradford, Pa., growing on fine sand near the borders of a stream. The whole plant is much reduced and the leaves are more slenderly acuminate than usual.

## 2. BRYHNIA GRAMINICOLOR (Brid.).

*Hypnum graminicolor* Brid. Spec. Musc. 2: 251. 1812.

*Hypnum praelongum* var. Sulliv. Musc. Allegh. 44. 1845.

*Hypnum Sullivantii* Spruce, A. Gray Man. Ed. 1. 1848.

*Eurhynchium subscabridum* Kindb. Ottawa Nat. 7: 22. 1893.

*Eurhynchium Sullivantii* Jaeger & Sauerb. St. Gall. Nat. Gesell. 1876-77: 354. 1878.

*Gametophyte* slender, in closely intricate mats or cushions, pale-green to yellow-green, dirty-brownish green below, stems 1-2.5 cm. long, creeping, irregularly divided and branching, sometimes stoloniferous, sparingly radiculose, often brown and denuded of leaves; branches ascending, 5-10 cm. long, terete-foliate; branch leaves loosely imbricate to open erect, ovate-lanceolate, 0.6-0.8 × 0.25-0.3 mm., decurrent, acuminate, sharply serrate nearly to base, concave with margins reflexed below, strongly papillose by the thickening of the angles of the cell walls; median leaf-cells small, linear-oblong, 4-6: 1; quadrate alar cells few; stem leaves 0.75-1 × 0.4-0.45 mm., longer, and more slenderly acuminate: dioicous; perichaetial leaves sheathing with spreading points; the

inner oblong-lanceolate, abruptly long filiform-acuminate, distantly serrulate, often with traces of a costa. *Sporophyte* 10–15 mm. high; seta red-brown, slightly twisted to the right, very rough with large crowded papillae; capsule red-brown, ovoid to subglobose, urn 1.5 mm. long and about two-thirds as broad; operculum short-rostrate, scarcely more than long conic when moist, one-half length of urn; annulus present, easily detachable; teeth very slender pointed; segments shorter than the teeth, little or not at all split; cilia two, well developed, nodose; spores nearly smooth, 13–15  $\mu$ , apparently maturing in autumn.

Type locality, Pennsylvania, Muhlenberg. Type at Geneva.

On the ground or rocks in moist and shady places. New Brunswick to Minnesota, Illinois, and Georgia; Missouri, Bush.

Local and rarely fruiting. Reported from Vancouver Island, Roell, Hedwigia, **35**: 69. 1896 but probably a mistake.

ILLUSTRATIONS. Sulliv. Icon. Musc. *pl.* 105.

EXSICCATI. Sulliv. l. c.; Sulliv. & Lesq. Musc. Bor. Am. (Ed. 1) 291, (Ed. 2) 430; Aust. Musc. Appal. 334; Macoun, Can. Musc. 296.

Distinguished from *B. Novae-Angliae* by its more slender habit, smaller and more slenderly acuminate leaves which are much more strongly papillose.

2a. *BRYHNA GRAMINICOLOR HOLZINGERI* (Ren. & Card.).

*Eurhynchium Sullivantii Holzingeri* Ren. & Card. Bot. Gaz. **19**: 239. 1894.

More densely caespitose; branches shorter, generally obtuse; leaves broader, shorter acuminate.

Type locality in the District of Columbia, Coville; New Jersey, Best; Missouri, Demetrio.

This is the extreme variation in the direction of the characters noted above. The other extreme is reached in Drummond's Musc. Am. (S. States) 133 and Ren. & Card. Musc. Am. Sept. Exsic. 196, which is more straggling and stoloniferous; branch leaves more distant and open, lanceolate, reaching 1 mm. in length by 0.25 to 0.3 in breadth, long subfiliform acuminate, very strongly dentate-serrate and very strongly papillose roughened; stem leaves ovate-lanceolate, longer acuminate, reaching 1.3 mm. in length.

This latter form I have not yet seen fruiting. It appears from the data at hand to grow on moist rocks. It is widely distributed, occurring in Ontario, Connecticut, New York, Pennsylvania and Missouri. If it should prove to be a good variety and not merely habitat form, I would suggest the name *B. graminicolor acuminata*.

*Eurhynchium subscabridum* Kindb. approaches this form, and, according to the opinion of M. Cardot and myself, is in no way distinguishable from forms of *B. graminicolor*.

M. Cardot has seen Bridel's type of *Hypnum graminicolor*, and has very kindly communicated notes and camera lucida drawings of the leaves. We are both agreed that it is identical with *Hypnum Sullivantii* Spruce.

EURHYNCHIUM Br. & Sch. Bry. Eur., fasc. 57-61. 1854.

*Gametophyte* well developed, never minute, green to yellow-green, growing in wide loose mats, or sometimes in dense tufts. Stems prostrate or creeping, more or less pinnately branched, sometimes closely and regularly pinnate, usually somewhat stoloniferous; central strand present in all the species. Branch leaves pluriseriate, not complanate or secund, acuminate to obtuse, serrate, concave, more or less plicate; costa single, extending to the middle or beyond, usually ending in a spine underneath; median cells linear, 8-12: 1, basal broader and shorter, alar quadrate or round, apical cells strongly differentiated and rhomboidal to circular in the group of *E. strigosum*. Stem leaves ovate, acute to long and slenderly acuminate. Paraphyllia sparingly present in some species. *Sporophyte*, as in *Brachythecium*, except the operculum, which is very long rostrate, equaling  $\frac{1}{2}$ - $\frac{1}{3}$  the length of the urn, except in the group of *E. myosuroides*.

The species of this genus are quite closely related to *Scleropodium* and *Brachythecium*, and it is difficult to give any general character, except the long rostrate operculum, which distinguishes this genus from *Brachythecium*. It is distinguished from *Scleropodium* by the broader, shorter leaf-cells.

The genus can be divided into three groups:

I. The group of *E. strigosum*, including *E. strigosum*, *E. robustum*, *E. fallax*, *E. diversifolium*, and *E. hians*. This group is easily distinguished by the differentiated apical cells.

II. The group of *E. praelongum*, including *E. praelongum*, *E. Oreganum*, and *E. Brittoniae*. This group is characterized by the

broadly cordate-ovate, decurrent, abruptly long-acuminate stem leaves, and pinnate branching.

III. The group of *E. myosuroides*, including *E. myosuroides* and *E. stoloniferum*. This group is easily recognized by the shorter operculum and the small thick walled alar cells.

Apical cells of branch leaves oblong-rhomboidal to circular.\*

Seta rough.

1. *E. hians*.

Seta smooth.

Leaves spreading.

Branch leaves 0.6–0.9 mm. long.

2. *E. strigosum*.

Branch leaves 1–1.5 mm. long,† round-obtuse at apex.

3. *E. fallax*.

Leaves appressed-imbricate.

Alpine or boreal; usually in dense mats or cushions; slender.

4. *E. diversifolium*.

Lowland; in looser mats; more robust.

2b. *E. strigosum praecox*.

Apical cells of branch leaves not differentiated.

Alar cells merely broader and shorter than the median; operculum long rostrate.

Seta smooth or nearly so; stem leaves nearly entire.

6. *E. Brittoniae*.

Seta rough; stem leaves serrate.

Slender; variously branching, leaves not more than 1 mm. long.

5. *E. praelongum*.

Very robust; closely and regularly pinnate; branch leaves 1–1.5 mm. long.

7. *E. Oreganum*.

Alar cells minute, thick-walled; operculum conic or short rostrate.

Branches seldom flagelliform; branch leaves 1–1.5 mm. long; plants of eastern North America.

8. *E. myosuroides*.

Branches often very long, flagelliform; branch leaves 1.5–2 mm. long; plants of the Pacific slope.

9. *E. stoloniferum*.

1. EURHYNCHIUM HIANS (Hedw.) Jaegr. & Sauerb, St. Gall. Nat. Gesell. 1876–77: 357. 1878.

*Hypnum hians* Hedw. Sp. Musc. 272, pl. 70, f. 11–14. 1801.

*Hypnum praelongum* Hedw. St. Cr. 4: 76, pl. 29. 1797.

*Pterigynandrum apiculatum* Brid. Sp. Musc. 1: 137. 1806.

*Eurhynchium praelongum* Br. & Sch. Bryol. Eur. fasc. 57–61. pl. 8 (Excl. var.). 1854.

*Hypnum distans* Lind. Musc. Scand. 34. 1879.

*Gametophyte* in intricate, depressed mats, green to yellow-green, closely adherent to the substratum; stems 3–10 cm. long, creeping, strongly radiculose, little divided, extensively stolonifer-

\* *E. stoloniferum myurcellum* will be sought here.

† *E. strigosum robustum* has as large leaves, but they are acute.

ous, irregularly to subpinnately branching; branches ascending, nearly simple, 3–12 mm. long; branch leaves erect-spreading, appearing complanate when dry,  $0.8-1.1 \times 0.5-0.7$  mm., ovate, not decurrent, obtusely acute to short-acuminate with apex often twisted to the right, sharply serrate to the base, concave to nearly plane, sometimes appearing papillose by the thickening of the angles of the cell-walls; costa stout, extending  $\frac{4}{5} - \frac{5}{6}$  length of leaf, ending in a spine on the lower side of the leaf; median cells linear-oblong, 6–10 : 1; quadrate alar cells few, indistinct; apical cells rhombic, 2–3 : 1; leaves of stoloniferous stems small,  $0.4-0.6 \times 0.2-0.3$  mm., ovate-lanceolate, rather abruptly narrowed into a slender acumination, costa thin and short; upper stem leaves much like branch leaves, short-acuminate: dioicous; perichaetial leaves oblong-ovate, sheathing, rather abruptly narrowed to a long squarrose-recurved acumination, nearly ecostate, distantly dentate-serrate above. *Sporophyte* 10–25 cm. high; seta dark red-brown, somewhat twisted to the right, very rough with low rounded papillae; capsule a little lighter colored, inclined to horizontal, oblong-cylindric, curved, urn 2–2.5 mm. long, 3 : 1; little or not at all contracted under mouth when dry; operculum long-rostrate, three-fourths length of urn; annulus present, narrow, easily detached; segments nearly as long as teeth, more or less split; cilia usually 2, sometimes 3, strongly nodose; spores nearly smooth,  $10-12 \mu$ , maturing in late autumn.

On the ground in moist, shady places. Canada to the Gulf of Mexico east of the Mississippi; Minnesota, Holzinger; Missouri, Bush.

Type locality, Pennsylvania.

EXSICCATI. Drumm, *Musc. Am. (S. States)* 134. Sulliv. *Musc. Allegh.* 53; Sulliv. & Lesq. *Musc. Bor. Am. (Ed. 1)* 290, (*Ed. 2*) 428; Aust. *Musc. Appl.* 335; Ren. & Card. *Musc. Am. Sept Exsic.* 118 (*E. praelongum*).

ILLUSTRATIONS. Sulliv. *Icon. Musc. pl.* 104; as *E. praelongum*, Hedw. *l. c.*; Br. & Sch. *l. c.*; as *E. Swartzii* Dixon & Jam. *Handb. Brit. Mosses, pl.* 54 B.

A form from Florida (Austin, Underwood) has ovate-lanceolate branch leaves which are much more sharply acute than is usual.

A comparison of the difference between *E. praelongum* Hedw. and *E. hians* as given by Limpricht.

*E. praelongum.*

Not shining, golden green.

*E. hians.*

Golden green and opalescent, shining.



In the 50 or more specimens of each species that I have examined I have been unable to see that there is any difference in this respect.

All leaves distant.

Stem leaves distant, branch leaves close.

There is a great variation in this respect in the plants referred to both species but I can detect no perceptible difference between the European *E. praelongum* (Hedw.) and the American *E. hians*.

Cells of stem leaves 5-8: 1.

Cells of stem leaves 7-12: 1.

There is also a great variation in this respect in both, but no constant difference, and this variation does not seem to be correlated with the variations in the shape of the leaves.

Branch leaves almost plane.

Branch leaves very concave.

There is absolutely nothing in this distinction. The leaves of either may be plane or concave and there are great differences in this respect even on the same plant.

Perichaetial leaves faintly costate.

Perichaetial leaves ecostate.

Sullivant (*Icones Muscorum*, 163) says of *E. hians*; "Perichaetial leaves subcostate." There are faint but distinct traces of a costa in some or all of the perichaetial leaves in most of the *E. hians* I have examined. Mr. Dixon writes me that the perichaetial leaves of the British plant referred to *E. praelongum* Hedw. are often ecostate.

Seta purple.

Seta red.

This also does not hold.

Annulus persistent.

Annulus easily detachable.

I have not tried to verify this because it involved so much mutilation of specimens. It is a very doubtful distinction to say the least.

Seta 15-25 mm. long.

Seta 10-13 mm. long.

The seta of the European plant does seem to average a little longer, but there are plenty of specimens of American *E. hians* with seta 15-25 mm. long. So far as can be determined the length of the seta is not correlated with any of the other characters given as distinguishing.

Capsule strongly contracted under the mouth when dry.

Capsule not at all contracted under the mouth when dry.

I could distinguish absolutely no difference in this respect.

Spores faintly roughened.

Spores smooth.

There is no perceptible difference in this respect.

Acumination of stem leaf one-tenth length of leaf.	Acumination of stem leaf one-sixth length of leaf.
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There is a very great range of variation in this respect even on the same plant, but I was unable to discover any constant difference between the two.

All leaves similar in form.

Lower leaves lanceolate to ovate, 0.2–0.3 mm. wide, suddenly narrowed to a narrow reflexed acumination one-third the length of leaf.

Leaves of stoloniferous stem of both are much reduced in size and in very many cases long-acuminate in the European plant referred to *E. praelongum*.

To sum up: There is a very great range of variation in the characters enumerated above, especially in the width of the branch leaves and the length and slenderness of their acumination. The apex of the branch leaves of the European plant is slenderly acuminate in a larger proportion of cases than in the American, and the seta of the European plant averages longer.

*E. hians* is generally credited to Europe but the distinctions given will not hold as we have seen. If two species are to be made out of the European plants referred to *E. hians* and *E. praelongum* Hedw., the distinction will have to be based on different characters, one of which will, it seems to me, be the shape of the branch leaves. Our American plant differs considerably in this respect. Specimens from the Southern States have, as a rule, more slenderly pointed branch leaves, but there are all grades of intermediate forms and the difference is too slight to be of specific rank.

All the variations of the American plant can be duplicated in the European plant referred to *E. praelongum*, but the European plant varies further in the direction of narrow slenderly acuminate branch leaves with fewer differentiated apical cells.

Lindberg (*l. c.*) when separating *Hypnum distans* from *H. hians* evidently took his idea of *H. hians* from Sullivan's figure, which does not accurately represent the American plant as I understand it after having examined hundreds of specimens. In Sullivan's figure the leaves are much more slenderly acuminate and the apical

cells much narrower in proportion to their length than in almost all the plants I have seen. The figures of the branch leaves of *E. prælongum* (Hedw.) in the *Bryologia Europea* represent the branch leaves of *E. lians* much better than Sullivan's figure. The other European authors who have treated this species since Lindberg wrote seem to have adopted substantially his idea of *E. lians*.

Mr. H. N. Dixon has exchanged a large number of specimens with me and has carefully gone over the evidence of the identity of the European and American plant. He believes that *Hypnum atrovirens* Swartz, Disp. 65. 1799, is also identical with *E. lians*.

2. EURHYNCHIUM STRIGOSUM (Hoffm.) Br. & Sch. Bryol. Eur. fasc. 57-61, *pl.* 519. 1854.

*Hypnum strigosum* Hoffm., D. Fl. 2: 76. 1796.

*Hypnum thuringicum* Brid. Musc. Recent. 2<sup>2</sup>: 99. *pl.* 3. *f.* 2. 1801.

*Hypnum pulchellum* Hedw. Sp. Musc. 268. *pl.* 68 *f.* 1-4. 1801.

*Hypnum velutinoides* Voit. Musc. Herbig. 99. 1812.

*Rhynchostegium strigosum* De Not. Cronaca, 2: 11. 1867.

*Gametophyte* in wide loose mats, with a habit much like *Brachythecium velutinum*, green to yellow-green, stems creeping, densely radiculose, 5-10 cm. long, often stoloniferous at the ends, pinnately to subfasciculately branching; branches 3-8 mm. long, ascending or erect, terete-foliate, often appearing somewhat complanate foliate when dry, attenuate at the ends; branch leaves from the middle of the branches erect-spreading, ovate-lanceolate, very slightly, or not at all decurrent, 0.7-1 × 0.3-.55 mm., acute or often obtuse, especially towards the ends of the branches, sharply serrate above, concave, little or not at all plicate; costa extending four-fifths length of leaf, ending in a spine underneath, median leaf-cells linear, 7-10:1; quadrate and oval alar cells few, apical cells conspicuously shorter and broader, oblong-rhomboidal, 2-3:1; stem leaves elongated-triangular-ovate, more or less long-acuminate, gradually slender pointed, somewhat decurrent, serrate, 0.9-1.2 × 0.4-0.6 mm.; apex often twisted half around to the right; leaves of the stoloniferous stems, triangular-ovate, abruptly long-acuminate, ecostate, 0.7-5 × 0.3 mm.: dioicous or pseudo-monoicous, "annual buds containing antheridia adhering to radicle of fertile plants;" perichaetial leaves with sheathing bases and spreading points, oblong, narrowed to a slender subfiliform spreading acumination, ecostate, distantly serrate.

*Sporophyte* 10–20 mm. high; seta red-brown, smooth, twisted to the right; capsule brown to red-brown, oblong-ovoid to oblong-cylindric, unsymmetric, inclined to horizontal; urn 2–2.5 : 1, constricted below mouth when dry; operculum  $\frac{1}{2}$ – $\frac{2}{3}$  length of urn, abruptly long-rostrate; annulus of 2 or three rows of cells; segments nearly as long as teeth, split; cilia 2 or 3, nodose; spores 10–12  $\mu$ , nearly smooth, maturing in autumn.

Type locality, European.

On the ground, roots of trees, and decaying logs in woods and shady places; seemingly preferring steep shaded banks of ravines.

Ranging from Washington, British Columbia and Alaska to Labrador, south to the White Mountains, the Adirondacks, and the mountains of Colorado.

ILLUSTRATIONS. Br. Sch. l. c.; Hedw. l. c.; Wils. Bryol. Brit. *pl.* 55; Husnot, Musc. Gall. *pl.* 96; Dixon & Jam. Handb. Brit. Mosses, *pl.* 54. K.

The leaves of this species and its relatives vary so in shape that any attempt to define species by the degree of acuteness of the leaves or other similar character seems futile.

2a. EURHYNCHIMUM STRIGOSUM ROBUSTUM Röell, Hedwigia, 36 : 52. 1897.

*Eurhynchium strigosum* (in part) of American authors.

*Gametophyte* with the habit of *Brachythecium plumosum*, in wide intricate mats, green to yellow-green; stems creeping, densely radiculose, 5–10 cm. long, often stoloniferous at the ends, pinnately or subfasciculately branching; branches 6–12 mm. long, ascending or erect, often fasciculately divided, terete-foliate, more blunt than in *E. strigosum*; leaves from the middle of the branches erect-spreading, ovate-lanceolate, very slightly or not at all decurrent, 1–1.3  $\times$  0.4–0.5 mm., usually acute; quadrate and oval alar cells confined to the extreme angles; stem leaves 1.2–1.5  $\times$  0.4–0.6 mm., longer acuminate, acumination often subfiliform. *Sporophyte* rather larger than in the typical form.

Type locality, vicinity of Chicago, Illinois. Type duplicate in the herbarium of Columbia University.

Eastern Canada and in the United States from Louisiana to Minnesota and eastward. More abundant northward.

EXSICCATI. (As *Hypnum strigosum*.) Drumm. Musc. Am. (S. States) 131; Sulliv. Musc. Allegh. 11; Sulliv. & Lesq. Musc.

Bor.-Am. (Ed. 1) 292, in part, (Ed. 2) 431, in part; Aust. Musc. Appal. 332; Macoun, Can. Musc. 295.

The great majority of plants from eastern North America that have been referred to *E. strigosum* belong to this variety. Forms agreeing very closely with European *E. strigosum* are not rare in the United States and Canada, and are seemingly more frequent in elevated regions. Intergrading forms are very numerous, diversified, and extremely puzzling.

2b. EURHYNCHIIUM STRIGOSUM PRAECOX (Hedw.) Husnot, Musc. Gall. 332. 1893.

*Hypnum praecox* Hedw. Spec. Musc. 249, *pl.* 64. 1801.

*Gametophyte* caespitose or in looser intricate mats, green to yellow-green; stems creeping, 2-3 or even 8 cm. long, irregularly divided, subfasciculately branching, often stoloniferous; branches 3-6 mm. long, erect, julaceous, usually blunt; branch leaves crowded, imbricate-appressed when dry, erect-open when moist, cordate-ovate, more or less decurrent,  $0.5-0.8 \times 0.4-0.6$  mm., almost acute to very obtuse and rounded at apex, serrate above, serrulate nearly to the base, more or less plicate, concave with borders often reflexed below; costa extending at least three-fourths the length of the leaf, ending in a spine underneath; median cells linear-oblong, 6-8:1; quadrate and oval alar cells numerous, apical cells rhomboidal to nearly circular; leaves of the stolons much as in *E. strigosum*; stem leaves acute to abruptly filiform-acuminate, triangular-ovate, decurrent,  $0.8-1 \times 0.6$  mm., serrulate, costate to the middle. *Sporophyte* 6-10 mm. high; capsule ovoid, unsymmetric, horizontal; urn 1.5-2:1, more or less contracted under the mouth when dry and empty; operculum two-thirds length of urn, convex, abruptly long-rostrate; cilia 1-3, strongly nodose; spores very finely roughened, about  $12 \mu$ , maturing in autumn.

"More depauperate than the species, tufts loose, deep green; stems shortened, thick and nearly naked; branches and branchlets erect, 3-5 mm. long; stem leaves 0.7 mm. long by 0.4 mm. broad, plicate; branch leaves close, appressed-imbricate, broadly ovate, short acuminate, 0.6 mm. long by 0.3 mm. broad, margins somewhat reflexed above the middle, plicate; the upper branch leaves sometimes obtuse; leaf-cells  $6 \mu$  long, 10:1, elongated in the acumination; costa extending three-fourths the length of the leaf, ending in a spine on the under side. Sporophyte like the species; seldom fruiting." *Limpricht, Rab. Krypt. Fl.* 4<sup>3</sup>: 159. 1897.

On shady banks, moist soil and rocks. New York, New Jersey, Pennsylvania; Texas, G. Jeremy.

Type locality, Sweden.

ILLUSTRATIONS. Br. & Sch. Br. Eu. *pl.* 519, *f.*  $\beta$ .

EXSICCATI. Drumm. Musc. Am. (S. States) 130 (*Leskea fasciculosa*); Sulliv. & Lesq. Musc. Bor.-Am. (Ed. 1) 293, (Ed. 2) 432; Aust. Musc. Appal. 333.

Distinguished from the species by the julaceous branches, appressed-imbricate leaves, more obtuse and more decurrent.

2c. EURHYNCHIUM STRIGOSUM SCABRISETUM var. nov.

Seta plainly scabrous with scattered papillae; otherwise like var. *praecox*.

On shaded ground.

Type in the Columbia Herbarium from the Palisades, N. J., Austin; Sargentsville, N. J., Best; Rensselaer Co., N. Y., E. C. Howe; Vineyard Haven, Mass., R. E. Schwab.

In most sets of both editions of Sulliv. & Lesq. Musc. Bor.-Am. a portion of the specimen labeled *E. strigosum* is smaller and has julaceous branches and in some sets of Ed. 1, a scabrous seta. This portion I should refer to var. *praecox* or var. *scabrisetum* as the case may be.

The roughening of the seta is a character not mentioned in any European work or observed in any European specimen, and is probably a new development.

As a rule the branch leaves of *E. fallax* are strongly decurrent, those of *E. strigosum praecox* and *E. diversifolium* somewhat so, while those of *E. strigosum* are usually not at all decurrent. The stem leaves of all these forms are more or less decurrent.

All the available literature on *E. strigosum*, *E. strigosum praecox* and *E. diversifolium* has been carefully studied to discover a satisfactory arrangement of the forms usually referred to these species. The result has been very unsatisfactory and the matter cannot be definitely settled until the types are compared with American material. The European material in the Herbarium of Columbia University indicates that the forms usually referred to *E. diversifolium* belong rather to *E. strigosum praecox* and ac-

cordingly this ground is taken provisionally. Limpricht's description of the variety *praecox* is copied and a full description of the American plant is given. Some discrepancies will be noted. Some of the American forms referred provisionally to var. *praecox* are more robust than any European material which has been examined. Limpricht says that the true *E. diversifolium* is a true alpine moss, "Ein echtes Hochalpenmoos," which the *E. diversifolium* of Lesq. & James and most other American authors is not.

In the mountainous and boreal regions of the northern United States and Canada west of the longitude of the Mississippi there is found an alpine moss which agrees very closely with Rabenhorst's Bryoth. Eur. No. 1143 (*E. diversifolium*), which is cited by Limpricht (*l. c.* 160). This western plant has been referred to *E. diversifolium*. This view is seemingly contradicted by the fact that Schimper in the Bry. Eur. under *E. diversifolium* refers to it specimens from Ohio.

Whatever may be true of the names, the forms described, though intergrading to a considerable extent, are still so well defined as to be readily recognized.

### 3. EURHYNCHIUM FALLAX (Ren. & Card.).

*Eurhynchium strigosum* var. *fallax* Ren. & Card. Bot. Gaz. 14: 98. 1889.

*Eurhynchium substrigosum* Kindb. Macoun, Cat. Can. Pl. 6: 205. 1892.

*Gametophyte* in loosely intricate mats; robust, green to light yellow-green; stems 5-10 cm. long, procumbent, arcuate, ascending, often stoloniferous and rooting at the ends, giving off several secondary stems that bear comparatively few branches, branching irregular to subpinnate; branches 7-15 mm. long, terete-foliate, attenuate; branch leaves erect-open, usually long-decurrent, cordate-ovate to lanceolate-lingulate, 0.8-1.2 × 0.4-0.55 mm., rounded-obtuse, serrate above, serrulate to the base, concave, usually slightly plicate when dry; costa extending about seven-eighths the length of the leaf, ending in a spine underneath; median leaf-cells linear, 9-12:1; quadrate alar cells numerous; apical cells of various shapes, oblong-elliptical, elliptical, and circular; stem leaves larger and more narrowed at apex, 1.2-1.5 × 0.5-0.8 mm., only the lower and those of the stoloniferous stems acute or long-acuminate; monoicous; male branches scarce; perichaetial leaves with oblong

sheathing bases, very abruptly narrowed to filiform erect-spread-ing acumination, the inner with a long thin costa, serrulate or entire. *Sporophyte* 15–20 mm. high; seta red-brown, smooth, twisted to the right; capsule brown, oblong, unsymmetric, horizontal; urn  $2.5 \times 1$  mm., little constricted below the mouth when dry and empty; operculum conic, abruptly long-rostrate, beak two-thirds length of urn; annulus present, of at least two rows of cells; cilia stout, 2 or 3, nodose to subappendiculate; spores minutely roughened, 10–13  $\mu$ , maturing in winter.

Type locality, on old logs, Lake Pend d'Oreille, Idaho, Leiberg.

On the ground, roots of trees and decaying logs. Northern United States and Canada, in the Rocky Mountain region. Alaska, O. S. Bates; British Columbia, Macoun; Idaho, Sandberg, and Leiberg; Montana, Watson; Colorado, Wolf and Rothrock.

EXSICCATI. Ren. & Card. Musc. Am. Sept. Exsic. 116. Macoun, Can. Musc. 449, in the Columbia Herbarium as *E. substrigosum* Kindb., is not the species, but appears to be *E. strigosum robustum*. Authentic material of *E. substrigosum* has been examined.

Distinguished from *E. strigosum robustum* by the more diffuse straggling habit, more distant leaves, branch leaves broad and rounded at apex, and less acute stem leaves; from *E. strigosum* and its other varieties, and the other closely allied species it is easily distinguished by its greater size and looser habit.

### 3a. EURHYNCHIMUM FALLAX BARNESII (Ren. & Card.).

*Eurhynchium strigosum* var. *Barnesii* Ren. & Card. Bot. Gaz. 14: 98. 1889.

Stouter, with more slender, lingulate leaves which are also narrower at apex; capsule much larger and thicker.

Type locality the same as for the species.

Collected several times in Idaho by Sandberg and by Leiberg.

### 4. EURHYNCHIMUM DIVERSIFOLIUM (Schleich.) Br. & Sch. Bry. Eur. fasc. 57–61, pl. 520. 1854.

*Hypnum diversifolium* Schleich. in Herb. and Catal. 1807. (In part.) *Teste* Limpricht.



*Eurhynchium strigosum* var. *diversifolium* Molendo & Lorentz, Flora. 1867.

*Gametophyte* caespitose or in thick, densely intricate mats, green to yellow-green; stems 2–7 cm. long with long thick stolons, creeping, densely radiculose, sending up numerous fasciculately divided branches; branches short, 2–5 mm. long, julaceous, blunt; branch leaves appressed-imbricate, ovate, acute or rounded-obtuse,  $0.5-0.6 \times 0.36-0.45$  mm., serrulate, concave, excavate at the slightly decurrent angles; costa extending four-fifths length of leaf, often ending in a spine underneath; median leaf-cells linear to linear-oblong, 5–8 : 1, apical rhomboidal or nearly circular; area of quadrate alar cells much larger than in any of the allied species; stem leaves ovate, acute to long-acuminate, decurrent,  $0.8-1 \times 0.6-0.75$  mm.; leaf-cells narrower and longer, apical cells not differentiated; costa seldom ending in a spine; leaves of stoloniferous stems varying greatly in size on the different parts of the stolon: slightly open, without chlorophyll, elongated-triangular, long and narrowly acuminate; excavate at the angles, very long and narrowly decurrent; costa slender or wanting, “dioicous or pseudo-monoicous;” perichaetial leaves sheathing at base, with spreading acumination, oblong-ovate, abruptly long-acuminate; costa thin or wanting. *Sporophyte* 5–10 cm. high; seta red-brown, smooth, twisted to the right; capsule red-brown, ovoid to short-oblong, unsymmetric and inclined; 1.5 : 1, slightly contracted under the mouth when dry; operculum long-rostrate, nearly as long as the urn; “annulus of two rows of cells, persistent;” segments from a basal membrane one-third the length of the teeth; cilia 2 or 3, appendiculate; spores finely roughened, 14–18  $\mu$ , maturing in winter.

Type locality, European. Type at Kew.

On the ground and rocks in mountainous and boreal regions of western North America, especially in the Rocky Mountain region. Utah, Watson; British Columbia, Macoun; Idaho, Leiberg; Montana, R. S. Williams; Colorado, Mrs. S. L. Clark, and Marie Holzinger; Ohio, *vide* Schimper, l. c.; S. Dakota, M. A. Thompson.

ILLUSTRATIONS. Br. & Sch. l. c.; Husnot, Musc. Gall. *pl.* 96, *f.* 8–9; Limpricht, Rab. Krypt. Fl. 4<sup>3</sup>, *f.* 34.

EXSICCATI. Macoun, Can. Musc. 500.

Limpricht, l. c., describes the branch leaves as round-obtuse with the costa seldom reaching three-fourths of the length of the leaf, but Rabenhorst's *Bryotheca Europea*, 1143, which he cites agrees with the American material in these respects as well as in the di-

mensions of the leaf-cells. It seems pretty certain that our American plant here referred to *E. diversifolium* agrees with Limpricht's idea of this species and it certainly agrees with the accessible European exsiccati. While resembling *E. strigosum praecox* in many ways it can be readily distinguished by its slender habit, smaller branch leaves and more numerous quadrate alar cells.

5. EURHYNCHIMUM PRAELONGUM (Dill. L.) Bryhn, Explor. Bryol. in Valle Norv. Stördalen, 59. 1893. (*Fide* Limpricht.)

*Hypnum repens filicium, triangularibus parvis foliis praelongum* Dill. Cat. Giss. 219. 1718, et Hist. Musc. 278. *pl. 35, f. 15a.* 1741, et herbarium (*Teste* Lindberg).

*Hypnum praelongum* L. Sp. Pl. 1125. 1753. (Non Hedw. St. Cr. 4: 76. *f. 29.* 1797.)

*Eurhynchium pseudospeciosum* Kindb. Can. Rec. Sci. 1894: 22. 1894.

*Eurhynchium acutifolium* Kindb. Rev. Bryol. 22: 84. 1895.

"Stems (in the type) slender, prostrate, elongated (2-5 inches), divided; at intervals rather regularly pinnate, with slender, somewhat attenuated, often curved, not very crowded, subcomplanate branches; forming low, somewhat straggling masses of a bright or dull green, less commonly yellowish. Stem leaves distant or more rarely crowded, widely cordate-triangular or widely ovate-cordate, rapidly or even abruptly and longly acuminate in a long often almost filiform, squarrose acumen; at base wide, excavate, strongly decurrent; margin plane, regularly and distinctly denticulate, nerve slender, reaching above half-way and usually into the acumen; cells linear, slightly vermicular, tapering but obtuse, 10-18 times as long as wide, pellucid; towards base wider and shorter, lax, at angles large, subrectangular, but not forming clearly defined auricles. Paraphyllia occasionally but not always present. Branch leaves much narrower, widely or even narrowly lanceolate, gradually acuminate, very acute, somewhat erect when dry, more spreading when moist, not complanate, moderately soft in texture and often twisted when dry, not plicate, hardly glossy. Perichaetial bracts squarrose, very longly acuminate. Seta rather long, often one inch. Capsule turgidly ovate, narrower when ripe and empty, horizontal, abruptly passing into the seta at base, rather large; lid subulate-rostrate, usually decurved, almost as long as the capsule. Dioicous."

The above excellent description is copied from Dixon and

Jameson's Handbook of British Mosses, p. 416. The species is rare in America and Mr. Dixon has had a much better chance to become acquainted with it, as it is common in England.

Type locality European.

On soil and decayed stumps.

California: Bolander, no. 83;\* Olema, Marin Co., Jan. 11, 1894 (on old logs) Howe; San Mateo Mts., S. H. Burnham; White Mts., N. H., Oakes; Oregon, Hall; Vancouver Island, Lyall, Macoun; Washington, Suksdorf, Piper, Fenzler.

ILLUSTRATIONS. Dill. *l. c.*; Dixon & Jam. Handb. Brit. Mosses, *pl.* 54 *A*.

EXSICCATI.\* Sulliv. & Lesq. Musc. Bor. Am. (Ed. 2) 433, (*Hypnum Stokesii*). Also sent out by Macoun as No. 100 of his Canadian Cryptograms under the name of *Eurhynchium pseudospeciosum*. Canadian Musci 442 (*E. hians*?).

There has been an almost endless amount of confusion as to the nomenclature of this plant. Wilson, Mitten, Dixon and Lindberg have applied the name to one plant, and Hedwig, Schimper, Husnot, Limpricht, and Cardot to another. The plant of Lindberg and the British bryologists is very closely allied to *E. Stokesii*, indeed, the latter appears to be only a variety of it. The *E. praelongum* of Hedwig and Schimper is identical with our *E. hians*. Now the two species that have borne this name are utterly and entirely distinct and could not be confused by the veriest tyro. The decision as to what is the true *E. praelongum* must rest with the Dillenian plant on which Linnaeus founded *Hypnum praelongum*. Lindberg saw the plant in Dillenius' herbarium† and declares that it is the plant that the British bryologists have called *E. praelongum*. As Lindberg was an acute observer, and has the best possible grounds for his opinion, I shall follow him until something more authoritative appears. One reason for the continuance of the confusion is the fact that the true *E. praelongum* is rare on the continent

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\* Mr. Dixon has examined the starred plants.

† Lindberg's statement is found in his Kritik Granskning af Mossorn uti Dillenia Historia Muscorum, 17, 1883. He gives the following citation from Dillenius' Hist. Musc. and herbarium: "15. H. repens filicinum triangularibus parvis foliis praelongum. P. 278, tab. 35. fig. 15. Herb. fol. 93. no. 15." He then adds this note: "Fig. A. Hypnum praelongum L. c. fr. — vera planta, cujus subspecies H. stokesii Turn. est nec auctorum recentiorum (h. e. H. distans Lindb.)."

and in America and when found has nearly always been referred to *E. Stokesii*.

*E. praelongum* is distinguished from its variety *Stokesii* by its less robust, more straggling appearance, less rigid stems, fewer paraphyllia and less regularly pinnate and less bipinnate branching. There is not the difference between the relative dimensions of the leaf-cells that is indicated by the two descriptions. I think Mr. Dixon's figures are too large. The leaves of the species are frequently more distant than those of the variety and the branches are much fewer in number.

Dr. Roell has sent to Mrs. Britton specimens of Fenzler's collection of *Eurhynchium acutifolium* Kindb. from the type locality at Enumclaw, Washington. This plant is not different from *E. praelongum*. It is described as "monoecious" but one fragment 3 cm. long bore five male branches and no female thus giving evidence of being dioicous. Fenzler's plant is a brighter yellow than the majority of specimens of *E. praelongum*.

5a. EURHYNCHIMUM PRAELONGUM STOKESII (Turn.) Dixon l. c.

*Hypnum Stokesii* Turn. Musc. Hiber. 159. pl. 15. f. 5. 1804.

*Hypnum praelongum* var. *Stokesii* Brid. Sp. Musc. 2: 103. 1812.

*Eurhynchium Stokesii* Br. & Sch. Bryol. Eur. fasc. 57-61. pl. 526. 1854.

*Gametophyte* in wide intricate mats, green to light yellowish green; stems rigid, procumbent, often stoloniferous, irregularly divided; 10-13 cm. long, sparingly radiculose, sending up suberect secondary stems which are closely and regularly pinnate, often bipinnate and 2-3 cm. long, branching more or less perfectly pinnate; branchlets slender, 3-13 mm. long, terete-foliate; branch leaves erect-open, decurrent, ovate-lanceolate, acuminate, 0.7-0.8 × 0.45 mm., smaller at the apex of the branches and on the smaller branchlets, serrate above, serrulate to the base; angles of the cell walls very slightly papillose-thickened; costa extending three-fourths length of leaf, often ending in a spine underneath; median cells oblong-linear, 5-8 : 1, broader and shorter at the decurrent angles; stem leaves distant, squarrose, strongly decurrent, triangular-ovate, abruptly long and slenderly acuminate, 0.7-0.9 × 0.9-1.3 mm., serrate (nearly entire on some of the stoloniferous portions) basal cells thicker walled, quadrate alar cells more numerous than in the branch leaves; paraphyllia borne sparingly on the stems (Dixon l.

*c.* describes the paraphyllia as numerous), leaf-like, triangular-ovate to ovate-lanceolate: dioicous; perichaetial leaves ovate with sheathing bases, abruptly narrowed to a long slender squarrose acumination, strongly dentate-serrate, ecostate. *Sporophyte* 2–3 cm. high; seta red-brown, stout, twisted to the right, very rough with large blunt papillae; capsule oblong-ovoid, red-brown, slightly unsymmetric, horizontal, slightly contracted under the mouth when dry; urn about 2 mm. long, 1.5–2:1; operculum long-rostrate, nearly as long as urn; annulus large, easily detachable; segments nearly as long as the teeth; cilia 2 or 3, nodose; spores 10–14  $\mu$ , maturing in late autumn or early winter.

Type locality, Ireland.

On the ground and roots of trees, west of the Rocky Mountains in the northern United States and Canada, Idaho, Washington, Oregon, California, Vancouver Island, British Columbia. Apparently common within this range. Newfoundland (*Fide* Cardot).

ILLUSTRATIONS. Turner, l. c.; Br. & Sch. l. c.; Husnot, *Musc. Gall.* pl. 98.

EXSICCATI. Macoun, *Can. Musc.* 297; Ren. & Card. *Musc. Am. Sept. Exsic.* 119.

Our American plant is as a rule considerably stouter than the European and more regularly pinnate varying towards *E. Oreganum* which is most certainly a derivative of it. One of the best characterized of these forms is

5b. *EURHYNCHIMUM PRAELONGUM CALIFORNICUM* var. nov.

*Gametophyte* with the habit of a *Thuidium*; stems 15–20 cm. long, closely and regularly pinnate, seldom stoloniferous, more robust throughout; leaves of the maximum size.

Type from California, Bolander no. 46. 1876. In the herbarium of Columbia University.

6. *EURHYNCHIMUM BRITTONIAE* sp. nov.

*Gametophyte* in wide intricate mats, dark green; stems creeping, radiculose, 5–10 cm. long, sparingly divided; branching closely and regularly pinnate; branches 5–10 mm. long, teretefoliate; branch leaves open-erect, 0.7–0.9  $\times$  0.3–0.4 mm., gradually long-acuminate, lanceolate to ovate-lanceolate, serrate to the base, slightly or not at all decurrent; leaf-cells oblong-linear, 5:1, alar

quadrate; costa extending four-fifths the length of the leaf, often ending in a spine underneath; stem leaves deltoid-ovate,  $1.8 \times 1$  mm., including the filiform acumination which is 0.5–0.8 mm. long, serrulate at base, nearly entire above, strongly excavate at the decurrent angles; quadrate and rhomboidal alar cells numerous; perichaetial leaves sheathing at base, ovate to oblong-ovate, with a long filiform squarrose acumination, ecostate, distantly spinose toothed on the margins above. *Sporophyte* 1.5–2 cm. high; seta red-brown, twisted to the right, nearly or quite smooth; capsule oblong-cylindric, unsymmetric and horizontal; urn 1.5 mm. long, 2:1, contracted below the mouth when dry; operculum long-rostrate, at least two-thirds the length of the urn; annulus? segments from a basal membrane which is at least two-thirds the height of the teeth; segments split between the articulations; cilia 2 or 3, strongly nodose; spores finely roughened, about  $15 \mu$ .

Type from California, Bolander. Specimens of this species of Bolander's California collections are in the National Museum from "Little River (Mendocino Co.?) at the foot of pine tree, no. 332." Also in the herbarium of Mr. J. M. Holzinger as no. 530.

This species is very closely related to *E. praelongum Californicum* and greatly resembles it in appearance but is easily distinguished by its nearly smooth seta and nearly entire stem leaves.

Named in honor of Mrs. E. G. Britton in recognition of her assistance in the preparation of this monograph and of her services to American bryology.

7. EURHYNCHIMUM OREGANUM (Sulliv.) Jaeger & Sauer. St. Gall. Nat. Gesell. 1876–77: 361. 1878.

*Hypnum Oreganum* Sulliv. Mem. Am. Acad. 4: 172. 1849.

*Gametophyte* in wide loose mats; yellow-green above, brownish green below the surface; stems procumbent, densely radiculose at points of contact with substratum, 6–25 cm. long; sparingly divided, closely and regularly pinnate, often bipinnate; branches 1.3–2.5 cm. long; branches terete-foliate, tapering; branch leaves open, erect, decurrent, broadly cordate-ovate,  $1-1.5 \times .75-1$  mm., acuminate, sharply serrate above, serrulate to base, somewhat concave and slightly plicate, costa stout, extending nearly to base of acumination, ending in a spine at the back; median cells linear, about 7:1; extreme alar cells thick-walled, oblong to rhomboidal; stem leaves larger, reaching  $2 \times 1.3$  mm., more broadly ovate, longer acuminate: dioicous; male branches abundant; perigonal leaves ovate, long-acuminate, ecostate, distinctly dentate; antheridia numerous, clavate; perichaetial leaves sheathing at base with reflexed points, ovate to oblong-ovate, abruptly long

and slenderly acuminate, ecostate, sharply dentate-serrate. *Sporophyte* 2–2.5 cm. high; seta red-brown, twisted to the right, very rough with high blunt papillae; capsule lighter colored, horizontal to slightly drooping, unsymmetric, oblong-ovoid, 2–2.5 mm. long, 2–1, slightly contracted under the mouth when dry and deoperculate; operculum a little shorter than urn; annulus present, well developed, of at least two rows of cells, easily detachable; segments as long as the teeth, more or less split between the articulation; cilia 2–3, well developed; nodose to short-appendiculate; spores 15–20  $\mu$ , nearly smooth, maturing in winter.

On the ground, decaying logs and base of trees. California, Oregon, Washington, Vancouver Id., Idaho, British Columbia.

ILLUSTRATIONS: Sulliv. Bot. Wilkes Expd. Musc. 16. *pl.* 13. *B.*

EXSICCATI. Sull. & Lesq. Musc. Bor.-Am. (Ed. 2) 434; Macoun, Can. Musc. 298; Ren. & Card., Musc. & Am. Sept. Exsic. 120.

A beautiful species, closely allied to *E. Stokesii*; easily distinguished from that and other species by its large size and regularly pinnate stems.

8. EURHYNCHIUM MYOSUROIDES (Dill. L.) Schimp. Syn. Ed. 1: 549. 1860.

*Hypnum myosuroides tenuis capsulis natantibus* Dill. Hist. Musc. 317, *pl.* 41, *f.* 51. 1741, and Herb.

*Hypnum myosuroides* L. Sp. Pl. 1130. 1753.

*Isothecium myosuroides* Brid. Bryol. Univ. 2: 369. 1827.

*Rhynchostegium myosuroides* DeNot. Epil. 79. 1869.

*Gametophyte* in soft intricate light green to brownish green tufts; primary stems creeping, secondary stems 15–25 mm. long, suberect, dendroid and often stoloniferous, frequently becoming arcuate and giving off dendroid innovations like *Hylocomium proliferum*; branching subpinnate to fasciculate; branches often again divided; ultimate branchlets 5–8 mm. long, sometimes flagelliform and much lengthened; branch leaves pluriseriate, often somewhat secund, ovate-lanceolate to oblong-lanceolate, 1–1.3  $\times$  0.25–0.35 mm., acute to long acuminate, serrulate at apex, sometimes papillose at apex on the back by the thickening of the angles of the cell walls; costa extending to the middle or beyond, sometimes forking; median leaf-cells linear, 5–7:1; alar cells round-quadrangle, incrassate; stem leaves triangular-ovate, long-acuminate, less strongly serrate, basal cells often thick-walled and brown; leaves of primary stems very small, distant, squarrose;

paraphyllia none : dioicous ; male branches gemiform, small ; inner perigonial leaves ovate, acuminate, concave, ecostate, slightly denticulate ; perichaetium 2–3 mm. long, the inner leaves with an ovate-lanceolate sheathing base and a long squarrose-recurved acumination, serrate above, costate. *Sporophyte* 1.5–2 cm. high ; seta smooth, twisted to the left above or often irregularly bent, and twisted ; capsule brown, oblong-ovoid, suberect, and slightly unsymmetric to horizontal and curved, 2–2.5 mm. long, 3–4 : 1 ; operculum conic, apiculate to short-rostrate ; annulus of 2–3 rows of cells, easily deciduous ; segments from a wide basal membrane, as long as the teeth, more or less split along the median line ; cilia 2 or 3, nearly as long as the segments ; spores minutely roughened, about 16  $\mu$ , maturing in autumn or early winter.

Type locality European ; type at Oxford in the Dillenian herbarium.

In cool shady places on rocks and roots of trees in alpine and boreal regions. Rare in America. Trinity Bay, Newfoundland, Waghorne ; Nova Scotia, James ; White Mts. (North Conway) N. H. Oakes.

ILLUSTRATIONS. Dill. l. c. ; Br. & Sch., Bry. Eur. *pl.* 434 ; Wilson, Bry. Brit. *pl.* 25, Dixon & Jam. Handb. Brit. Mosses, *pl.* 54. *H.*

EXSICCATI. Sull. & Lesq. Musc. Bor. Am. (Ed. 2) 424.

Our eastern plant agrees very closely with the European *E. myosuroides*, but the western form referred to this species is quite different in a number of characters and I believe it should all be referred to *E. stoloniferum* (Hook). The only western specimen examined that seemed at all doubtful was from Guadalupe Island, Lower California, collected by Edward Palmer (no. 115) in 1875. The circumstances were such that the accuracy of this label is doubted.

An exceedingly variable species especially in leaf characters ; var. *filescens* Ren. & Card. is a slender form with branches often flagelliform. For the distinctions between this species and *E. stoloniferum* see notes under that species.

9. EURHYNCHIMUM STOLONIFERUM (Hook.) Jaeger & Sauerb. St. Gall. Nat. Gesell. 1876–77 : 347. 1878.

*Hypnum stoloniferum* Hook. Musc. Exot. 1 : *pl.* 74. 1818.

*Isothecium stoloniferum* Brid. Bry. Univ. 2 : 371. 1827.



*Hypnum myosuroides stoloniferum* C. Muell. Syn. 2: 500. 1851.

*Hypnum spiculiferum* Mitt. Journ. Linn. Soc. 8: 34. 1865.

*Hypnum acuticuspis* Mitt. l. c.

*Isothecium pleurozoides* Kindb. Can. Rec. Sci. 1894: 19. 1894.

*Isothecium obtusatum* Kindb. Can. Rec. Sci. 1894: 19. 1894.

(Roell 117, Vancouver). *Fide* Cardot, Rev. Bryol. 35: 310. 1896.

*Gametophyte* in wide, soft, loosely intricate tufts, light green to brownish green, often glossy; primary stems slender, long-creeping, radiculose, furnished with minute distant leaves; secondary stems dendroid, suberect, 5 cm. or more long, very much branched; branches two or three times divided, of varying length, often long-flagelliform, branches and branchlets inclined to one side; branch leaves varying greatly in habit, spreading to loosely imbricate when dry, sometimes subsecund,  $1.5-2 \times 0.3-0.4$  mm., oblong-lanceolate to ovate-lanceolate, acuminate with point often twisted to the right, serrulate below, coarsely serrate above, smooth or papillose on the back by the thickened angles of the cell walls, margins often slightly revolute below; costa extending to the middle or beyond, often ending in a spine on the back; median leaf-cells linear, rather thick-walled, 7-10: 1; alar cells round-quadrate, incrassate and indistinct; apical leaves of branchlets attenuate; leaves of creeping stems scale-like, 0.7 mm. long, narrowly acuminate, subdenticulate, costate to the middle; leaves of erect stems like those of creeping stems only larger with costa sometimes forking, gradually enlarged and elongated above where they approach the branch leaves in shape and size; leaves of the flagellae distant, slender, lanceolate, often very long-acuminate, serrate: dioicous; the inner perichaetial leaves with broad sheathing bases and long-acuminate squarrose apices, serrate above or nearly entire; costa thin, sometimes wanting; paraphyses very numerous, long, composed of two or more rows of cells at base. *Sporophyte* much as in *E. myosuroides*; capsule ovoid, 2-2.5 mm. long, 2.5-3.1.

Type locality, western part of western North America; Menzies, 1787.

On the ground, trees, and rocks in woods. Apparently common on the Pacific coast. Alaska, Miss Cooley; Colorado, Shockley.

ILLUSTRATIONS. Brid. l. c.; Hook. l. c.

EXSICCATI. Macoun Can. Musc. 292 in part, 291 (*Isothecium myosuroides*), 293 (*Hypnum spiculiferum*), 656 (*Isothecium pleurozoides*).

An exceedingly variable and perplexing species. The papillose character of the leaves is of no value whatever as a distinction, as the leaves of European *E. myosuroides* are frequently papillose and this character varies even on leaves of the same plant. I have seen type specimens of *Hypnum acuticuspis* Mitt. and *Hypnum spiculiferum* Mitt. The specimens of *H. spiculiferum* were larger and had larger, longer acuminate, more strongly acuminate leaves on the secondary stems than is usually the case with *E. stoloniferum*, but there were two well developed cilia with rudiments of a third. It appears to be a well-developed form of *E. stoloniferum*. *Isothecium pleurozoides* is a broad leaved form varying in the direction of var. *myurcellum*.

*E. stoloniferum* differs from *E. myosuroides* in its larger size, more frequent and better developed flagellate branches, in the longer branch leaves with a broader and more gradually narrowed acumination, and broader and longer median cells. The stem leaves also are slightly rounded at the basal angles, as broad as long and narrowed to a comparatively long slender acumination.

9a. EURHYNCHIUM STOLONIFERUM CARDOTI (Kindb.).

*Isothecium Cardoti* Kindb. Bull. Torr. Bot. Club, **17**: 278. 1890.

Bright glossy yellow-green; secondary stems irregularly pinnately branching, 5–10 cm. long, sometimes bearing long rigid flagellae at the ends; branch leaves reaching 3 mm. in length by 0.7 mm. in breadth.

A beautiful variety representing the maximum development of the species. So large and striking is it in appearance that at first sight one feels that it must surely be a distinct species, but there is a whole chain of common and intermediate forms. The species itself is one of the most variable species known to me, thus making it impossible to base a distinct species on a form whose principal difference is mere size. It is possible that *E. stoloniferum* itself should be regarded as a subspecies of *E. myosuroides*, but some specific lines seems imperative between such divergent forms as the European *E. myosuroides* and *Isothecium Cardoti* Kindb.

Type locality, Hastings, B. C. On base of trees and logs. Victoria, Vancouver Id.; Washington.

EXSICCATI. Macoun, Can. Musc. 394.

## 9b. EURHYNCHIIUM STOLONIFERUM MYURCELLUM (Kindb.).

*Isothecium myurcellum* Kindb. *l. c.*

Branches seldom flagelliform, having a much smoother subjuvaceous appearance due to the shorter, more appressed leaves; branch leaves ovate-lanceolate to ovate-elliptical, obtusely acute to short-acuminate,  $1-1.2 \times 0.3-0.4$  mm., coarsely, often doubly, serrate above, concave; median cells 5-7:1, the upper shorter and broader; apical cells rhombic-elliptical, 2-3:1; round-quadrate alar cells more numerous.

On stones and decaying logs.

Type from Victoria and Nanaimo Rivers, Vancouver Island.

Colorado, Shockley; Vancouver Island, Macoun; Marin and Sonoma Counties, California, M. A. Howe.

EXSICCATI. Macoun, Can. Musc. 397, and 292 in part.

By reason of its habit and short pointed branch leaves with well differentiated apical cells, this variety also seems a good species at first sight, but all the intermediate forms of leaves can frequently be found in the same tuft and sometimes even on the same plant.

## DOUBTFUL SPECIES.

EURHYNCHIIUM DAWSONII Kindb. Bull. Torr. Bot. Club, 17: 278. 1890.

*Gametophyte* in thin intricate mats, dirty green, branches tipped with bright somewhat glossy green leaves; branch leaves loosely intricate, slightly or not at all decurrent, ovate, more or less long-acuminate, concave, serrulate above, margins slightly reflexed at base,  $1-1.2 \times 0.5$  mm.; costa very stout, extending four-fifths length of leaf; median cells oblong-linear, 6-8:1; area of quadrate alar cells large. Sporophyte not seen.

Described from a specimen bearing this label, "On stones in ditch west side of Black's Hotel, Hastings B. C., April 29, 1889."

Resembling *L. crassinervum* in the stout costa, broad leaf-cells and numerous quadrate alar cells; differing in the slender habit and smaller ovate branch leaves.

The following is the original description:

"Stems densely pinnate, not or rarely radiculose; branchlets patent. Leaves green or brownish, not glossy, not or indistinctly papillose, not long-acuminate from the broad ovate base, recurved on the borders below, long-decurrent, open-erect, denticulate all

around, areolation variable, often sub-rhomboidal; costa thick, reaching nearly to the apex. Probably dioicous."

"Allied to *E. hians* and *E. Sullivantii*."

"On rocks along the Nanaimo River below the railway bridge, Nanaimo, Vancouver Island, April 27, 1887."

EURHYNCHIUM PSEUDO-VELUTINOIDES Kindb. Rev. Bryol. **22** : 84.  
1895.

"Leaves not or slightly striate, distant, subulate-acuminate and filiform pointed, faintly reflexed near the base. Stem leaves subobovate or ovate-oblong, entire; costa scarcely reaching to the middle. Branch leaves ovate-lanceolate, denticulate all around; costa reaching somewhat above the middle. Perichaetial leaves with a very long filiform point. Capsules not found: pedicel rough. Tufts loose and green. Stems pinnate, not creeping. Leaves patent or spreading when dry. Probably monoecious."

"Canada, Vancouver Island, earth (1893): Macoun."

No specimens available and original description quoted.

EURHYNCHIUM CRASSINERVIUM (Tayl.) Br. & Sch. var. LAXORETE  
Kindb. Macoun, Cat. Can. Pl. **6** : 207. 1892.

"Differs in the leaves being nearly entire or faintly denticulate above, shorter acuminate and the cells larger. Only male flowers found."

"On earth in woods at Canaan Forks, Queen county, New Brunswick. J. Moser."

No specimens available and original description quoted.

#### EXCLUDED SPECIES.

*Eurhynchium subintegrifolium* Kindb. Ottawa Nat. **7** : 21.  
1893.

Specimens from "earthy banks by the sea, Comox, Vancouver Island, no. 146b (sterile); coll. J. Macoun" have the costa short and double and certainly are not referable to this genus.

*Eurhynchium pseudo-serrulatum* Kindb. Ottawa Nat. **7** : 22.  
1893. = *Brachythecium Starkei*.

*Eurhynchium semiasperum* C. M. & Kindb. Macoun Cat. Can. Pl. **6** : 207. 1892. = *Brachythecium plumosum*.

The remainder of Kindberg's new species of *Eurhynchium* be-

long, according to his own classification, to groups that are not here included in *Eurhynchium*.

*Eurhynchium colpophyllum* Sulliv. is a *Scleropodium*, *S. colpophyllum* (Sulliv.).

*Hypnum lentum* Mitt. appears to be a *Scleropodium* also, *S. lentum* (Mitt.).

About *Hypnum apocladum* Mitt. nothing further is known and it is doubtful to what genus it should be referred.

*Hypnum Brewerianum* Lesq. certainly does not belong in *Eurhynchium*.

*Hypnum aggregatum* Mitt. is a synonym for *H. Brewerianum* Lesq.

*Isothecium Howei* Kindb. Rev. Bryol. 22 : 82. 1895, is probably nothing but a variety of *H. Brewerianum*.